

DC/DC Railway Converter

TEQ 160WIR Series, 160 Watt

- High power block with excellent thermal convection
- Operating temperature -40°C to +75°C without derating
- Increased shock & vibration resistance
- Ultra wide 4:1 input voltage range
- EN 50155 approval for railway applications
- Excellent efficiency up to 90%
- Input filter meet EN 55022, class A
- I/O insulation 1591 VAC
- Under voltage lock-out circuit



The TEQ 160WIR Series is a family of isolated high performance DC/DC converter modules with ultra-wide 4:1 input voltage ranges which come in a rugged, sealed metal case.

These converters are suitable for a wide range of applications, but the product is designed particularly also for industrial applications where often no PCB mounting is possible but the module has to be mounted on a chassis. A very high efficiency and the overall heatsink construction allows an operating temperature up to +75°C with natural convection cooling without power derating and up to +90°C with power derating. Further features include output voltage trimming, Remote On/Off and under voltage lockout. The very wide input voltage range and reverse input voltage protection make these converters also an interesting solution for battery operated systems.

Models

Order Code	Input Voltage Range	Output Voltage nom. (adjustable)	Output Current max.	Efficiency typ.
TEQ 160-4812WIR	19 - 75 VDC (48 VDC nom.)	12 VDC (9.6 - 13.2 VDC)	13'000 mA	90 %
TEQ 160-4815WIR		24 VDC (19.2 - 26.4 VDC)	6'500 mA	90 %
TEQ 160-4816WIR		28 VDC (22.4 - 30.8 VDC)	5'500 mA	90 %
TEQ 160-4818WIR		48 VDC (38.4 - 52.8 VDC)	3'200 mA	90 %
TEQ 160-7212WIR	43 - 160 VDC (110 VDC nom.)	12 VDC (9.6 - 13.2 VDC)	15'000 mA	89 %
TEQ 160-7215WIR		24 VDC (19.2 - 26.4 VDC)	7'500 mA	89 %
TEQ 160-7216WIR		28 VDC (22.4 - 30.8 VDC)	6'500 mA	89 %
TEQ 160-7218WIR		48 VDC (38.4 - 52.8 VDC)	3'800 mA	89 %

Options

TEQ-MK1	- Optional DIN-Rail Mounting Kit: www.tracopower.com/products/teq-mk1.pdf
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Input Specifications

Input Current	- At no load	110 Vin models: 10 mA typ. 48 Vin models: 20 mA typ. (12 Vout model) 20 mA typ. (24 Vout model) 20 mA typ. (28 Vout model) 25 mA typ. (48 Vout model)
Surge Voltage		48 Vin models: 100 VDC max. (1 s max.) 110 Vin models: 185 VDC max. (1 s max.)
Under Voltage Lockout		48 Vin models: 15.5 VDC min. / 16.5 VDC typ. / 18 VDC max. 110 Vin models: 33 VDC min. / 35.5 VDC typ. / 38 VDC max.
Recommended Input Fuse		(The need of an external fuse has to be assessed in the final application.)
Input Filter		Internal Common Mode Choke + Pi-Type

Output Specifications

Output Voltage Adjustment		-20% to +10% (By trim potentiometer) Output power must not exceed rated power!
Voltage Set Accuracy		±1% max.
Regulation	- Input Variation (Vmin - Vmax) - Load Variation (0 - 100%)	0.1% max. 0.1% max.
Ripple and Noise (20 MHz Bandwidth)		12 Vout models: 100 mVp-p typ. 24 Vout models: 200 mVp-p typ. 28 Vout models: 200 mVp-p typ. 48 Vout models: 300 mVp-p typ. 12 Vout models: 125 mVp-p max. 24 Vout models: 250 mVp-p max. 28 Vout models: 250 mVp-p max. 48 Vout models: 350 mVp-p max.
Capacitive Load	- 48 Vin input - 110 Vin input	12 Vout models: 10'800 µF max. 24 Vout models: 2'700 µF max. 28 Vout models: 1'900 µF max. 48 Vout models: 660 µF max. 12 Vout models: 12'500 µF max. 24 Vout models: 3'100 µF max. 28 Vout models: 2'300 µF max. 48 Vout models: 790 µF max.
Minimum Load		Not required
Temperature Coefficient		±0.02 %/K max.
Hold-up Time		10 ms min. (acc. to EN 50155 Class S2, see application note for ext. capacitor calculation: www.tracopower.com/info/holdup_en50155.pdf)
Start-up Time		75 ms typ.
Short Circuit Protection		Continuous, Automatic recovery
Output Current Limitation		120 - 150% of Iout max.
Overvoltage Protection		115 - 130% of Vout nom.
Transient Response	- Response Time	200 µs typ. / 250 µs max. (25% Load Step)

Safety Specifications

Safety Standards	- IT / Multimedia Equipment - Industrial Control Equipment - Railway Applications - Certification Documents	EN 62368-1 IEC 62368-1 UL 62368-1 UL 508 CSA-C22.2, No. 107.1 EN 50155 www.tracopower.com/overview/teq160wir
Pollution Degree		PD 2

All specifications valid at nominal voltage, resistive full load and +25°C after warm-up time, unless otherwise stated.

EMC Specifications

EMI Emissions		EN 50121-3-2 (EMC for Rolling Stock)
- Conducted Emissions		EN 55011 class A (internal filter)
		EN 55032 class A (internal filter)
- Radiated Emissions		EN 55011 class A (internal filter)
		EN 55032 class A (internal filter)
EMS Immunity		EN 50155 (Railway Applications)
		EN 50121-3-2 (EMC for Rolling Stock)
		EN 55024 (IT Equipment)
		EN 55035 (Multimedia)
		EN 61204-3 (Low Voltage Power Supplies)
- Electrostatic Discharge	Air:	EN 61000-4-2, ± 8 kV, perf. criteria A
	Contact:	EN 61000-4-2, ± 6 kV, perf. criteria A
- RF Electromagnetic Field		EN 61000-4-3, 20 V/m, perf. criteria A
- EFT (Burst) / Surge		EN 61000-4-4, ± 2 kV, perf. criteria A
		EN 61000-4-5, ± 1 kV, perf. criteria A
		EN 61000-4-5, ± 2 kV, perf. criteria A
- Conducted RF Disturbances		EN 61000-4-6, 10 Vrms, perf. criteria A
- PF Magnetic Field	Continuous:	EN 61000-4-8, 100 A/m, perf. criteria A

General Specifications

Relative Humidity		95% max. (non condensing)
Temperature Ranges	- Operating Temperature	-40°C to +90°C
	- Storage Temperature	-40°C to +105°C
Power Derating	- High Temperature	Depending on model
		See application note: www.tracopower.com/overview/teq160wir
Over Temperature Protection Switch Off	- Protection Mode	105°C min. / 115°C typ. / 120°C max. (Automatic recovery)
Cooling System		Natural convection (20 LFM)
Sense Function		10% max. of Vout nom.
Remote Control	- Voltage Controlled Remote	On: 3.0 to 12 VDC or open circuit
		Off: 0 to 1.2 VDC or short circuit
		Refers to 'Remote' and '-Vin' Pin
	- Off Idle Input Current	8 mA max.
	- Remote Pin Input Current	-0.5 to 1.0 mA
Altitude During Operation		2'000 m max.
Switching Frequency		225 - 275 kHz (PWM)
		250 kHz typ. (PWM)
Insulation System		Reinforced Insulation
Working Voltage (rated)		182 VAC
Isolation Test Voltage	- Input to Output, 60 s	2'250 VDC
	- Input to Case, 60 s	1'600 VDC
	- Output to Case, 60 s	1'600 VDC
Isolation Resistance	- Input to Output, 500 VDC	1'000 M Ω min.
Reliability	- Calculated MTBF	400'000 h (MIL-HDBK-21 7F at 55°C, ground benign)
Environment	- Vibration	MIL-STD-810F
		EN 61373
	- Mechanical Shock	MIL-STD-810F
		EN 61373
	- Thermal Shock	MIL-STD-810F
		EN 50155
Housing Material		Aluminum
Potting Material		Silicone (UL 94 V-0 rated)
Housing Type		Metal Case
Mounting Type		Chassis Mount

All specifications valid at nominal voltage, resistive full load and +25°C after warm-up time, unless otherwise stated.

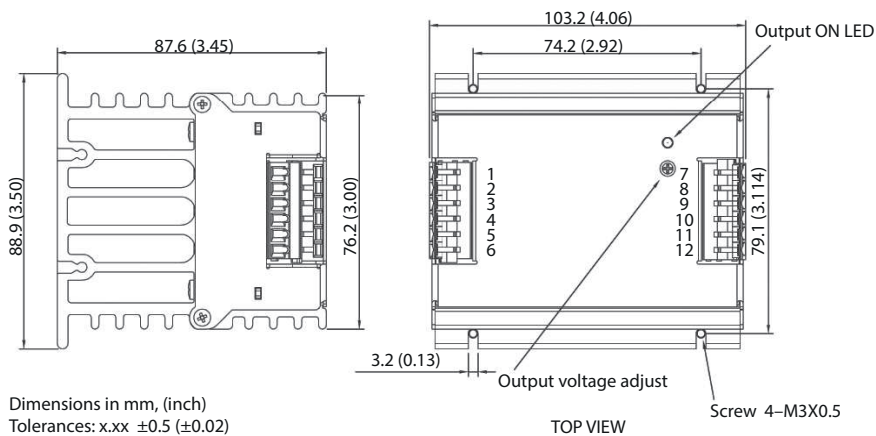
Connection Type	Spring Clamps
Weight	800 g
Thermal Impedance	- Case to Ambient 1.45 K/W typ.
Environmental Compliance	- REACH Declaration www.tracopower.com/info/reach-declaration.pdf REACH SVHC list compliant REACH Annex XVII compliant - RoHS Declaration www.tracopower.com/info/rohs-declaration.pdf Exemptions: 7a, 7c-l (RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule.)) - SCIP Reference Number 2ff38252-a003-4575-ab82-5cf26842ecfe - Flammability (EN 45545-2) www.tracopower.com/info/en45545-declaration.pdf

Supporting Documents

Overview Link (for additional Documents)

www.tracopower.com/overview/teq160wir

Outline Dimensions



Dimensions in mm, (inch)
Tolerances: x.xx ±0.5 (±0.02)
Mounting screw locked torque: max. 5.0 kgfcm / 0.49 Nm

Terminal connection		
Terminal	Pin Function	Recommended Wire
1,2	-Vin	12 AWG
3	NC	-
4	On/Off Ctrl	14 - 18 AWG
5, 6	+Vin	12 AWG
7, 8	-Vout	12 AWG
9	-Sense*	14 - 18 AWG
10	+Sense*	14 - 18 AWG
11, 12	+Vout	12 AWG

NC: Not connected

- * Sense line to be connected to the output either at the module or at the load under regard of polarity.
- The current rating of the terminal block is 15 A/pole.
- Using 2 poles in parallel if the peak output current can exceed 15 A.
- Wire size shall be selected to withstand the peak output current (I_{out} max + Current limitation).